

**EXHIBIT 1**

**Land Mobile/Mobile Satellite Service Meeting Agenda**  
**Wednesday May 3, 1995**

- 1. Introduction**
  - 1.1. Need for Additional MSS Allocation
  - 1.2. Basis for Shared Services
  - 1.3. Candidate Bands
- 2. MSS System Characterization**
  - 2.1. Background
  - 2.2. Services
  - 2.3. Current Spectrum Allocations
  - 2.4. Operations
    - 2.4.1. FDMA
    - 2.4.2. CDMA
- 3. Land Mobile Characterization**
  - 3.1. Background
  - 3.2. Services
    - 3.2.1. DPLM
    - 3.2.2. Auxiliary Broadcast
    - 3.2.3. Maritime
  - 3.3. Spectrum Use
    - 3.3.1. Channilization
    - 3.3.2. Bandwidth
    - 3.3.3. Power
    - 3.3.4. Traffic Characteristics
      - 3.3.4.1. Numbers of users
      - 3.3.4.2. Density of users
      - 3.3.4.3. Levels of use
- 4. Sharing Evaluations**
  - 4.1. Interstitial Use
  - 4.2. PDF Limits
- 5. Action Items**
- 6. Summary and Path to Closure**

**NVNG-MSS/Land Mobile Meeting  
May 3, 1995**

**ATTENDEES**

<u>Name</u>	<u>Affiliation</u>	<u>Phone/Fax</u>
Burt Levin	Final Analysis	301-474-0111/474-3228
Thomas Keller	VLBMH/AAR	202-371-6060/371-6279
Chris Allman	AAR	202-639-2217/639-2218
Alireza Shahnam	APCO	904-322-2500/322-2502
Carl Frank	WRCF/Motorola	202-429-7269/429-7207
Allen Davidson	Motorola	708-576-5972/576-3240
Mark E. Crosby	ITA	703-528-5115/524-1074
Robert Gurss	APCO	202-457-7329/457-7814
Stuart Overby	Motorola	202-371-6940/842-3578
Kristi Kendall	FCC	202-739-0741/887-6126
Ed Kemp	Union Pacific/AAR	402-271-4883/271-6204
Larry Miller	AASHTO	202-624-8480/624-5806
B.K.Y.	CTA	301-816-1327/816-1426
Richard Chitty	CTA	301-816-1347/816-1416
Shelley Sadowsky	Rosenman & Colin/LeoOne USA	202-463-4640/463-7199
Paul Locke	ORBCOMM	703-406-5397/406-3508
Joe Sandri	API (Keller & Heckman)	202-434-4284/434-4646
Peter Zernik	UTC	202-331-9495/331-7639
L.R. Raish	Fletcher, Heald & Hildreth (Harris Corp)	703-812-0480/812-0486
Susan Jones	Gardner, Carton & Douglas	202-408-7108/289-1504
Klaus Bender	ITA	703-528-5115/524-1074
Erik Goldman	LeoOne USA	314-746-0585/721-3410
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Stephen D. Kress	MRFAC, Inc.	703-318-9206/318-9209
Cecilia M. Hayes	Int'l Taxicab & Livery Assn.	301-946-5700/946-4641
Len Braun	PCIA	703-739-0300/739-1608
Ken Newcomer	Starsys	301-794-5203/794-7106
Ron Jarvis	Catalano & Jarvis/FAI	202-338-3500/333-3585

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**EXHIBIT 2**

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**TABLE I**  
**FREQUENCY SPECTRUM ALLOCATION**  
**100-500 MHz BAND**  
**MARCH 1995**

**BAND:** 100-500 MHz (VHF and UHF)**BANDWIDTH:** 400 MHz

<b>EXCLUSIVE GOVERNMENT:</b>	138-144 MHz,	6.0 MHz
	225-328.6 MHz,	103.6 MHz
	335.4-399.9 MHz,	64.5 MHz
	410-420 MHz,	10.0 MHz
	<b>TOTAL</b>	<b>184.1 MHz</b>

<b>SHARED GOVERNMENT &amp; NON-GOVERNMENT:</b>	108-121.9375 MHz,	13.9375 MHz
	123.5875-128.8125 MHz,	5.225 MHz
	132.0-136.0 MHz,	3.9875 MHz
	137-138.0 MHz,	1.00 MHz
	148-150.8 MHz,	2.800 MHz
	157.6375-157.1875,	0.15 MHz
	162.0125-173.2 MHz,	11.1875 MHz
	173.4-174 MHz	0.600 MHz
	216-225 MHz	9.000 MHz
	328.6-335.4 MHz	6.8 MHz
	399.9-410.0 MHz	10.1 MHz
	420-450 MHz	30.0 MHz
	460-470 MHz	10.0 MHz
	<b>TOTAL</b>	<b>104.7875 MHz</b>

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TABLE I  
FREQUENCY SPECTRUM ALLOCATION  
100-500 MHz BAND  
MARCH 1995  
(continued)

<b>NON-GOVERNMENT ONLY:</b>	100-108 MHz,	8.0 MHz
	121.9375-123.5875 MHz,	1.65 MHz
	128.8125-132.0125 MHz,	3.20 MHz
	136.0-137.0 MHz,	1.0 MHz
	144.0-148.0 MHz,	4.0 MHz
	150.8-157.0375 MHz,	6.2375 MHz
	157.1875-162.0125 MHz,	4.825 MHz
	173.2-173.4 MHz,	0.2 MHz
	174-216 MHz	42.0 MHz
	450-460 MHz	10.0 MHz
	470-500 MHz	30.0 MHz
	<b>TOTAL</b>	<b>111.1125 MHz</b>
<b>FM BROADCASTING:</b>	100-108 MHz*,	8.0 MHz
<b>VHF-TV BROADCASTING:</b>	174-216 MHz**,	42.0 MHz
<b>UHF-TV BROADCASTING:</b>	470-500 MHz**,	30.0 MHz
	<b>TOTAL</b>	<b>80.0 MHz***</b>

\*Part of FM Broadcasting Band.

\*\*Part of VHF and UHF-TV Broadcasting Band.

\*\*\*Also included above under Non-Government Only.

## **APPENDIX A**



**ENGINEERING STATEMENT  
RE COMMENTS IN IC DOCKET NO. 94-31  
REVIEW AND ANALYSIS OF SPECTRUM  
BETWEEN 100-512 MHZ FOR SHARING WITH  
NVNG MSS SERVICES**

**MAY 1995**

**COHEN, DIPPELL AND EVERIST, P.C.  
CONSULTING ENGINEERS  
RADIO AND TELEVISION  
WASHINGTON, D.C.**

This engineering statement is submitted for association with the Joint Comments filed in IC Docket No. 94-31. A detailed review and analysis of the frequency spectrum between 100-500 MHz was made in order to identify suitable frequency band(s) for use by the non-voice non-geostationary orbit mobile-satellite service (NVNG MSS). Based on this analysis, a number of frequency bands were identified as feasible candidates for sharing with NVNG MSS services including those discussed below.

**450.0-451.0 MHz and 455.0-456.0 MHz**  
**Auxiliary Broadcast Band**

A review and analysis of the frequencies allocated to the remote pickup auxiliary broadcast service in the frequency sub-bands 450.0-451.0 MHz and 455.0-456.0 MHz<sup>1</sup> has been made to assess the potential of sharing these bands with the non-voice non-geostationary orbit mobile-satellite service (NVNG MSS). The relatively low number of auxiliary broadcast assignments within these sub-bands and the typical operational characteristics of these auxiliary broadcast assignments makes these bands feasible for sharing with NVNG MSS.

An extract of the international and United States allocation tables listing of these two sub-bands is shown in the attached Table I. In accordance with Section 2.106 of the Commission's rules, these two 1 MHz wide bands are allocated for land

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<sup>1</sup> Assignable frequencies are within 450.01-450.99 MHz and 455.01-455.990 MHz.

mobile operations. These bands are primarily used for auxiliary broadcasting under Part 74 of the Commission's rules. The 450-451 MHz band is also listed for use for satellite communication under Part 25 of the Commission's rules. The center frequency 450.0 MHz with 500 kHz bandwidth may be used by Government and non-Government stations for space telecommand at specific locations on a case-by-case basis.

Auxiliary broadcast services are used by the radio stations, broadcast networks and cable network entities for the transmission of material from the scene of events back to studio, communications related to production of remote programs, and technical support including cues, orders, dispatch instructions, frequency coordination, establishing microwave links, and for telemetry and control.<sup>2</sup> This service is also used for tests and drills to check performance of emergency circuits. The allocated frequencies are used by remote pickup base and mobile stations and the mobile stations generally operate within 50 miles of their associated fixed sites. The channel widths in this band range from 10 to 100 kHz. In order to facilitate the varying needs of stations in the remote pickup auxiliary broadcast service, most assigned frequencies are in 5 KHz segments. In the 450-451 MHz and 455-456 MHz sub-bands, these may be stacked together to form channels with 50 KHz band width. A limited number

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<sup>2</sup> 450.01, 450.02, 450.98, 450.99, 455.01, 455.02, 455.98, and 455.99 MHz are limited to operational communications, including tones for signaling and for remote control and automatic transmission system control and telemetry.

of channels are provided which can be stacked for bandwidths up to 100 KHz. The maximum authorized transmitter power for remote pick up stations is limited to 100 watts except for stations to be operated from aircraft which are normally limited to 15 watts.

There are currently 26,227 and 27,407 transmitters listed in the FCC database<sup>3</sup> authorized in the 450-451 MHz and 455-456 MHz bands, respectively, in the continental United States. Average power used by the auxiliary operations is 30 watts for fixed and 15 watts for portable/mobile transmitters and the channel bandwidths vary from 25 to 100 kHz. A substantial number of the auxiliary operations are for point-to-point service and many operate intermittently. The typical sensitivity of the receivers is 0.5 micrvolts for 20 dB S/N ratio. Although the geographical distribution (see attached maps<sup>4</sup> Figures 1 and 2) of auxiliary broadcast licenses indicates the use of these bands is authorized for auxiliary broadcast stations throughout the country, the level of usage is neither heavy nor continuous. Many stations have substituted these bands with the use of alternate technologies, e.g.,

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<sup>3</sup> This information is based on the FCC database obtained from its commercial contractor, Interactive Systems, Inc. (ISI).

<sup>4</sup> These maps show the licensed coordinates of base and mobile transmitters obtained from the FCC database. However, only one reference coordinates are shown for number of mobile units associated with a remote pick-up operation. In addition, some of the marked locations may be used by more than one operation.

cellular telephone. Monitoring<sup>5</sup> of the two sub-bands was performed in the Washington, D.C., area to sample the level of transmissions during regular business hours including the evening rush hour. These observations indicated very few transmissions within these bands during the monitoring period which support our contention that levels of usage are low and intermittent.

**459.0-460.0 MHz**  
**Domestic Public Land Mobile Band (DPLM)**

This band is allocated for domestic public land mobile (DPLM) service under Part 22 and for maritime service under part 80 of the FCC rules. The database indicates there are currently 80,543 transmitters authorized within this band. The frequency 459.0 MHz may be authorized to stations in the petroleum radio services for use primarily in oil spill containment and clean up operations. In addition to DPLM, other services listed in the database are for domestic public air-ground (CG), rural radio (CR), auxiliary broadcast (BA) and business (IB). The police radio services are authorized to operate low powered radio transmitters on a secondary non-interference basis. It is reported that this band is not actively being used by the hundreds of authorized transmitters.

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<sup>5</sup> Monitoring on the roof of a 13 story building was made using a popular scanner. Its sensitivity is listed by the manufacturer in the range of 0.5 uv/m to 1.3 uv/m.

This DPLM band was also monitored with a scanner to assess the level of usage within this band in the Washington, D.C. area during regular business hours, including the evening rush hour. These observations indicated very few transmissions within this band during the monitoring period which support our contention that levels of usage is low and intermittent. Attached map<sup>4</sup> (Figure 3) shows the geographical distribution of authorized base stations in the 459-460 MHz sub-band.

#### Proposed Sharing

It is proposed to share the 455-456 MHz and 459-460 MHz bands with the NVNG MSS service uplinks and to share the 450-451 MHz band with feeder uplinks. It is planned that fewer than 20 earth stations (gateways) for feeder uplinks would be required in the continental United States. The estimate for earth stations includes all of the eight proposed or authorized NVNG MSS operations. The feeder links would operate with less than 20 watts transmitter power. A steerable yagi antenna with 10 dBi gain would be employed by the satellite earth stations. A typical transceiver will require approximately 15 kHz bandwidth with less than 7 watts transmitter power using a typical UHF antenna with 0 dB gain. The transceivers will transmit the data with short bursts in the order of less than 50 milliseconds. The duty cycle of these operations would be very low.

In conclusion, the characteristics of remote pickup auxiliary broadcast and DPLM operations and the NVNG MSS services make harmonious sharing of these sub-bands practical. Sharing between MSS services and these bands can be accomplished by employing a combination of following techniques.

- a. Dynamic Channel Avoidance
- b. Low Duty Cycle
- c. Brief Message Duration
- d. Geographical Separation

Dynamic channel avoidance would be used in the NVNG MSS FDMA system in frequency-agile fashion to co-exist with auxiliary broadcast services. The mobile satellite would employ a scheme known as Dynamic Channel Activity Assignment System. In this system, the channel selected for earth-to-space transmissions would be the one which is not being used in a particular area by the auxiliary broadcast services. The satellite would scan the bands and measure the received power in a 3 kHz filter using a step size of 2.5 kHz. The scan time would be 5 seconds. Each measurement would be processed in a weighted average; filtered for short-term statistics (talker activity) and long-term statistics (calling activity). Based on the measurement data, a channel for transmission would be selected in an area where use of that channel does not have a potential of causing interference to the auxiliary broadcast and DPLM services. In addition, the frequencies listed under Section

74.402(a)(4) which are used for operational communications for remote pick-up stations will be avoided. Also, part of the DPLM band (459.025-459.650 MHz) will be used for sharing with NVNG MSS operations.

The nature of the new NVNG MSS service indicates it would involve very low duty cycles. Therefore, preclusion from using a channel by a remote pickup station would be insignificant. Most of the transmissions are likely to be a few times per day at most. This would further minimize any potential of interference to the auxiliary broadcast and DPLM services. In addition, the feeder links earth station sites, which may have relatively higher duty cycles, will be carefully planned and located in areas where these bands are currently very lightly used. The site will be also selected where necessary to provide as much shielding as possible to the current users, for example, sites located in rural areas or in valleys.

The proposed MSS system involves transmissions in the form of very short bursts in the order of 50 milliseconds or less. Such short duration bursts have less potential of causing unacceptable interference to the voice transmission of auxiliary broadcast and DPLM systems.

As stated previously, fewer than 20 feeder link earth station sites would be required located in selected geographical areas, spread over the whole country. The



sites would be selected after careful planning and coordination with the current fixed receive locations of the auxiliary broadcast stations. In addition, where possible fixed locations for transceivers would be situated in areas which provide maximum possible separation from the authorized fixed receive locations of the auxiliary broadcast operations.

Therefore, using the above listed techniques and with coordination and careful planning of the NVNG MSS systems, we believe it is possible to successfully share the 450-451 MHz, 455-456 MHz and 459-460 MHz bands without causing unacceptable interference to the auxiliary broadcast and DPLM operations.

**TABLE I**

INTERNATIONAL TABLE			UNITED STATES TABLE		FCC USE DESIGNATORS	
Region 1 Allocation MHz	Region 2 Allocation MHz	Region 3 Allocation MHz	Government Allocation MHz	Non-Government Allocation MHz	Rule Parts	Special Use Frequency
174-223 BROADCASTING	174-216 BROADCASTING Fixed. Mobile. 620	174-233 FIXED. MOBILE. BROADCASTING.				
621 623 628 629	216-220 FIXED. MARITIME MOBILE. Radiolocation 627 627A	619 624 625 626 630	216-220 MARITIME MOBILE Aeronautical Mobile. Fixed. Land Mobile. Radiolocation 627 US210 US229 US274 US317 G2	216-220 MARITIME MOBILE. Aeronautical Mobile. Fixed. Land Mobile. 627 US210 US229 US274 US317 NG121	MARITIME (80) Private Land Mobile (90) Personal Radio Service (95)	
	220-225					
335.4-399.9	FIXED. MOBILE.641		335.4-399.9 FIXED. MOBILE G27 G100	335.4-399.9		
399.9-400.05 RADIONAVIGATION- SATELLITE			399.9-400.05 RADIONAVIGATION- SATELLITE. MOBILE-SATELLITE (Earth-to space) US319 US326	399.9-400.05 RADIONAVIGATION- SATELLITE. MOBILE-SATELLITE (Earth-to-space) US319 US326		
609 645B			645B	645B		
420-430	FIXED. MOBILE except aeronautical mobile. Radiolocation.  651 652 653		420-450 RADIOLOCATION.  664 668 US7 US87 US217 US228 US230 G2 G8	420-450 Amateur.  664 668 US7 US87 US217 US228 US230 NG135	LAND MOBILE (90).    Amateur (97).	

**TABLE I**

INTERNATIONAL TABLE			UNITED STATES TABLE		FCC USE DESIGNATORS	
Region 1 Allocation MHz	Region 2 Allocation MHz	Region 3 Allocation MHz	Government Allocation MHz	Non-Government Allocation MHz	Rule Parts	Special Use Frequency
430-440 AMATEUR. RADIOLOCATION. 653 654 655 656 657 658 659 661 662 663 664 665	430-440 RADIOLOCATION. Amateur.  653 658 659 660 660A 663 664					
440-450						
450-460	FIXED MOBILE  653 668 669 670		450-460  668 669 670 US87	450-451 LAND MOBILE  668 US87	AUXILIARY BROADCASTING (74)  SATELLITE COMMUNICATIONS (25)	
				455-456 LAND MOBILE	AUXILIARY BROADCASTING (74)	
				459-460 LAND MOBILE  NG-12,NG-112, NG-148	DOMESTIC PUBLIC LAND MOBILE (22)  MARITIME (80)	

Notes: (Extracted from Part 2 of the Commission's Rules)

- 609** Emissions of the radionavigation-satellite service in the bands 149.9-150.05 MHz and 399.9-400.05 MHz may also be used by receiving earth stations of the space research service.
- 619** **ADDITIONAL ALLOCATION:** in China, the band 174-184 MHz is also allocated to the space research (space-to-Earth) and the space operation (space-to-Earth) services on a primary basis subject to agreement obtained under the procedure set forth in Article 14. These services shall not cause harmful interference to, or claim protection from existing or planned broadcasting stations.
- 621** **ADDITIONAL ALLOCATION:** in Austria, the Federal Republic of Germany, Austria, Belgium, Denmark, Spain, Finland, France, Israel, Italy, Liechtenstein, Monaco, Norway, the Netherlands, the United Kingdom, Sweden, Switzerland, and Yemen (P.D.R. of), the band 174-223 MHz is also allocated to the land mobile service on a permitted basis. However, the stations of the land mobile shall not cause harmful interference to, nor claim protection from, broadcasting stations, existing or planned, in countries other than those listed in the footnote.
- 623** **ADDITIONAL ALLOCATION:** in Congo, Ethiopia, Gambia, Guinea, Kenya, Libya, Malawi, Mali, Uganda, Senegal, Sierra Leone, Somalia, Tanzania, and Zimbabwe, the band 174-223 MHz is also allocated to the fixed and mobile services on a secondary basis.
- 624** **ADDITIONAL ALLOCATION:** in Bangladesh, India, Pakistan, and the Philippines, the band 200-216 MHz is also allocated to the aeronautical radionavigation service on a primary basis.
- 625** **ADDITIONAL ALLOCATION:** in Australia and Papua New Guinea, the bands 204-208 MHz and 222-223 MHz are also allocated to the aeronautical radionavigation service on a primary basis.
- 626** **ADDITIONAL ALLOCATION:** in China, India and Thailand, the band 216-223 MHz is also allocated to the aeronautical radionavigation service on a primary and to the radiolocation service on a secondary basis.
- 627** In Region 2, the band 216-225 MHz is also allocated to the radiolocation service on a primary basis until 1 January 1990. On and after 1 January 1990, no new stations in that service may be authorized. Stations authorized prior to 1 January 1990 may continue to operate on a secondary basis.

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- 627A** **ADDITIONAL ALLOCATION:** In Canada, the band 216-220 MHz is also allocated to the land mobile service on a primary basis.
- 628** **ADDITIONAL ALLOCATION:** In Somalia, the band 216-225 MHz is also allocated to the aeronautical radionavigation service on a primary basis, subject to not causing interference to existing or planned broadcasting services in other countries.
- 629** **ADDITIONAL ALLOCATION:** In Oman, the United Kingdom and Turkey, the band 216-235 MHz is also allocated to the radiolocation service on a secondary basis.
- 630** **ADDITIONAL ALLOCATION:** In Japan, the band 222-223 MHz is also allocated to the aeronautical radionavigation service on a primary basis and to the radiolocation service on a secondary basis.
- 641** Subject to agreement obtained under the procedure set forth in Article 14, the bands 235-322 MHz and 335.4-399.9 MHz may be used by the mobile-satellite service, on condition that stations in this service do not cause harmful interference to those of other services operating or planned to be operated in accordance with the Table.
- 645B** Recognizing that the use of the band 399.9-400.05 MHz by the fixed and mobile service may cause harmful interference to the radio navigation satellite service, administrations are urged not to authorize such use in application of No. 342.
- 651** **DIFFERENT CATEGORY OF SERVICE:** In Australia, the United States, India, Japan and the United Kingdom, the allocation of the bands 420-430 MHz and 440-450 MHz to the radiolocation service is on a primary basis (see No. 425).
- 652** **ADDITIONAL ALLOCATION:** In Australia, the United States, Jamaica and the Phillippines, the bands 420-430 MHz and 440-450 MHz are also allocated to the amateur service on a secondary basis.
- 653** **ADDITIONAL ALLOCATION:** In China, India, the German Democratic Republic, the United Kingdom and the U.S.S.R., the band 420-460 MHz is also allocated to the aeronautical radionavigation service (radio altimeters) on a secondary basis.

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- 654** DIFFERENT CATEGORY OF SERVICE: In France, the allocation of the band 430-434 to the amateur service is on a secondary basis (see No. 424).
- 655** DIFFERENT CATEGORY OF SERVICE: In Denmark, Libya, Norway, and Sweden, the allocation of the bands 430-432 MHz and 438-440 MHz to the radiolocation service is on a secondary basis (see No. 424).
- 656** ALTERNATIVE ALLOCATION: In Denmark, Norway and Sweden, the bands 430-432 MHz and 438-440 MHz are allocated to the fixed and mobile except aeronautical mobile, services on a primary basis.
- 657** ADDITIONAL ALLOCATION: In Finland Libya and Yugoslavia, the bands 430-432 MHz and 438-440 MHz are also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.
- 658** ADDITIONAL ALLOCATION: In Afghanistan, Algeria, Saudi Arabia, Bahrain, Bangladesh, Brunei, Burundi, Egypt, the United Arab Emirates, Ecuador, Ethiopia, Greece, Guinea, India, Indonesia, Iran, Iraq, Israel, Italy, Jordan, Kenya, Kuwait, Lebanon, Liechtenstein, Libya, Malaysia, Malta, Nigeria, Oman, Pakistan, the Phillipines, Qatar, Syria, Singapore, Somalia, Switzerland, Tanzania, Thailand and Togo, the band 430-440 MHz is also allocated to the fixed service on a primary basis and the bands 430-435 MHz and 438-440 MHz are also allocated to the mobile, except aeronautical mobile, service on a primary basis.
- 659** ADDITIONAL ALLOCATION: In Angola, Bulgaria, Cameroon, Congo, Gabon, Hungary, Mali, Mongolia, Niger, Poland, the German Democratic Republic, Romania, Rwanda, Chad, Czechoslovakia and the U.S.S.R., the band 430-440 MHz is also allocated to the fixed service on a primary basis.
- 660** DIFFERENT CATEGORY OF SERVICE: In Argentina, Columbia, Costa Rica, Cuba, Honduras, Panama and Venezuela, the allocation of the band 430-440 MHz to the amateur service is on a primary basis (see No. 425).
- 660A** ADDITIONAL ALLOCATION: In Mexico, the bands 430-435 MHz and 438-440 MHz are also allocated on a primary basis to the land mobile service, subject to agreement obtained under the procedure set forth in Article 14.

- 661** In Region 1, except in the countries mentioned in No. 662, the band 433.05-434.79 MHz (centre frequency 433.92 MHz) is designated for industrial, scientific and medical (ISM) applications. The use of this frequency band for ISM applications shall be subject to special authorization by the administration concerned, in agreement with other administrations whose radiocommunications services might be affected. In applying this provision, administrations shall have due regard to the latest relevant CCIR Recommendations.
- 662** In the Federal Republic of German, Austria, Liechtenstein, Portugal, Switzerland and Yugoslavia, the band 433.05-434.79 MHz (centre frequency 433.92 MHz) is designated of industrial, scientific and medical (ISM) applications. Radiocommunication services of these countries operating within this band must accept harmful interference which may be caused by these applications. ISM equipment operating in this band is subject to the provisions of No. 1815.
- 663** **ADDITIONAL ALLOCATION:** In Brazil, France and the French Overseas Departments in Region 2 and India, the band 433.75-434.25 MHz is also allocated to the space operation service (Earth-to-space) on a primary basis until 1 January 1990, subject to agreement obtained under the procedure set forth in Article 14. After 1 January 1990, the band 433.75-434.25 MHz will be allocated in the same countries to the same service on a secondary basis.
- 664** In the bands 435-438 MHz, 1260-1270 MHz, 2400-2450 MHz, 3400-3410 MHz (in Regions 2 and 3 only) and 5650-5670 MHz, the amateur-satellite service may operate subject to not causing harmful interference to other services operating in accordance with the Table (see No. 435). Administrations authorizing such use shall ensure that any harmful interference caused by emissions from a station in the amateur-satellite service is immediately eliminated in accordance with the provisions of No. 2471. The use of the bands 1260-1270 MHz and 5650-5670 MHz by the amateur-satellite service is limited to the Earth-to-space direction.
- 665** **ADDITIONAL ALLOCATION:** In Austria, the band 438-440 MHz is also allocated to the fixed and mobile, except aeronautical mobile, services on a primary basis.
- 668** Subject to agreement obtained under the procedure set forth in Article 14, the band 449.75-450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space).

- 668** Subject to agreement obtained under the procedure set forth in Article 14, the band 449.75-450.25 MHz may be used for the space operation service (Earth-to-space) and the space research service (Earth-to-space).
- 669** In the maritime mobile service, the frequencies 457.525 MHz, 457.550 MHz, 457.575 MHz, 467.525 MHz, 467.550 MHz, and 467.575 may be used by on-board communication stations. The use of these frequencies in territorial waters may be subject to the national regulations of the administration concerned. The characteristics of the equipment used shall conform to those specified in Appendix 20.
- 670** In the territorial waters of Canada, the United States and the Philippines, the preferred frequencies for use by on-board communication stations shall be 457.525 MHz, 457.550 MHz, 457.575, and 457.600 MHz paired, respectively, with 467.750 MHz, 467.775 MHz, 467.800 MHz, and 467.825 MHz. The characteristics of the equipment used shall conform to those specified in Appendix 20.
- US87** The frequency 450 MHz, with maximum emission bandwidth of 500 KHz, may be used by Government and non-Government stations for space telecommand at specific locations, subject to such conditions as may be applied on a case-by-case basis.
- NG12** Frequencies in the bands 454.40-455 MHz and 459.40-460 MHz may be assigned to domestic public land and mobile stations to provide a two-way air-ground public radiotelephone service.
- NG112** The frequencies 25.04, 25.08, 150.980, 154.585, 158.445, 159.480, 454.000, and 459.000 MHz may be authorized to stations in the petroleum radio services for use primarily in oil spill containment and cleanup operations and secondarily in regular land mobile communications.
- NG148** The frequencies 154.585 MHz, 159.480 MHz, 160.725 MHz, 160.785 MHz, 454.000, and 459.000 MHz may be authorized to maritime mobile stations for offshore radiolocation and associated telecommand OPERATIONS.



**FIGURE 1**

